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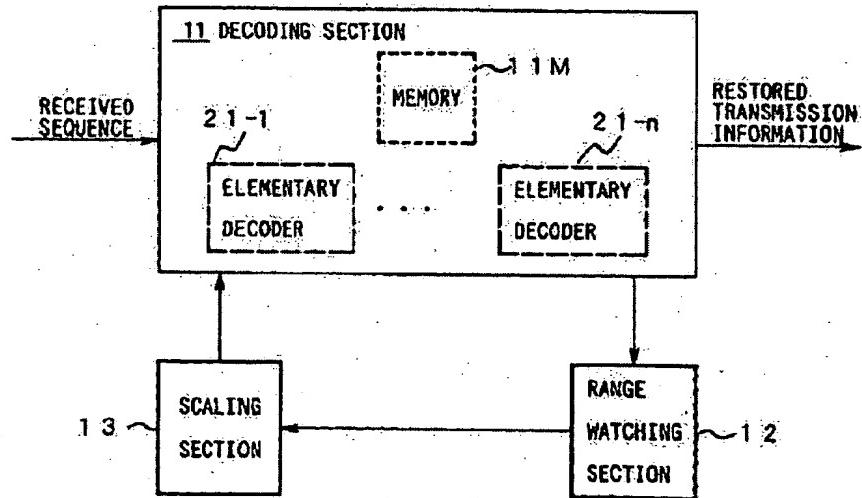
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### (54) Turbo decoder

(57) A turbo decoder is provided in which a distribution of likelihood values that are obtained during the course of turbo-decoding is watched and scaling of an operation object to be subjected to subsequent likeli-

hood computation of the turbo-decoding is performed in accordance with the distribution. This turbo decoder can reduce the cost, size, and power consumption of a transmission system and equipment, increase their reliability, and improve the transmission quality and performance.

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## EUROPEAN SEARCH REPORT

Application Number  
EP 00 11 0944

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim*	CLASSIFICATION OF THE APPLICATION (Int.Cl.)
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Y	* page 104, right-hand column - page 105, left-hand column; figure 8 *	4, 13, 16, 28, 34, 40, 49, 52	H03M
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The present search report has been drawn up for all claims			
Place of search:	Date of completion of the search:	Examiner	
MUNICH	21 August 2003	Burkert, F	
CATEGORY OF CITED DOCUMENTS:			
X : particularly relevant if taken alone	T : theory or principle underlying the invention		
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## EUROPEAN SEARCH REPORT

Application Number  
EP 00 11 6944

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EP 00 11 0944

DOCUMENTS CONSIDERED TO BE RELEVANT		Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.)
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A	US 5 721 745 A (ANDERSON JOHN BAILEY ET AL) 24 February 1998 (1998-02-24) * figure 2, *	4-6	
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MUNICH	21 August 2003	Burkert, F	
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Application Number:

EP 00 11 0944

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A	LANG LIN ET AL: "Improvements in SOVA-based decoding for turbo codes" PROC. OF IEEE INTERNATIONAL CONFERENCE ON COMMUNICATIONS, 8 June 1997 (1997-06-08), pages 1473-1478, XP010226998 Montreal, Canada ISBN: 0-7803-3925-8 * page 1473 - page 1476 *	19-36	
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The present search report has been drawn up for all claims.			
Place of search	Date of completion of the search	Examiner	
MUNICH	21 August 2003	Burkert, F	
CATEGORY OF CITED DOCUMENTS			
<input checked="" type="checkbox"/> X particularly relevant if taken alone <input checked="" type="checkbox"/> Y particularly relevant if combined with another document of the same category <input checked="" type="checkbox"/> A technological background <input checked="" type="checkbox"/> G non-written disclosure <input checked="" type="checkbox"/> P intermediate document			
T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons R: member of the same patent family, corresponding document			

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Application Number

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**CLAIMS INCURRING FEES**

The present European patent application comprised at the time of filing more than ten claims.

- Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

**LACK OF UNITY OF INVENTION**

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



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**LACK OF UNITY OF INVENTION**  
**SHEET B**

Application Number  
EP 00 11 0944

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions; namely:

1. Claims: 1,2,3,5,6,8,9,11,12,14,15,17,18,20,21,23,24,26,27,  
29,30,32,33,35,36,38,39,41,42,44,45,47,48,50,51,53,  
54

A turbo decoder with scaling of the extrinsic information, in which the soft channel values (LLRs) representing the systematic bit ("non-coded word") are scaled by a scaling factor, which is determined by a scaling means in dependence on a distribution of likelihood values obtained during the course of turbo decoding.

2. Claims: 4,13,22,31,40,49

A turbo decoder with scaling of the extrinsic information, which comprises n elementary decoders with n being smaller than the dimension of the parallel concatenated turbo code (where the dimension denotes the number of component codes).

3. Claims: 10,28,46

A turbo decoder with scaling of the extrinsic information, which comprises memory to be used for interleaving and deinterleaving, where the scaling of the extrinsic information is performed while reading from said memory.

4. Claim : 19

A turbo decoder with scaling of the extrinsic information, in which the scaling factor reduces the width of the range of likelihood values below a prescribed threshold, if the width of the range has exceeded this threshold.

5. Claim : 37

A turbo decoder with scaling of the extrinsic information, in which a range watching means obtains a distribution of likelihood values as a maximum value or as an average of likelihood values obtained in previous steps.

6. Claims: 7,16,25,34,43,52

A turbo decoder with scaling of the extrinsic information, which comprises a single elementary decoder that decodes all component codes of the turbo code in series, where the component codes may be different

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 00 11 0944

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on. The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

21-08-2003

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